(4015) 1979 VA: "Missing Link" Discovered

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Apollo Asteroid (4015) 1979 VA was discovered in November of 1979 by Helin at Palomar with the 0.46m Schmidt Telescope. Its' orbital elements immediately indicated a possible cometary origin. With an extremely eccentric orbit, it approaches the orbit of Jupiter (at the time, the largest "Q", aphelion, of any known near-Earth asteroid). Physical observations acquired during the discovery apparition suggested that it was carbonaceous in nature.

Research into prediscovery observations of Near-Earth Asteroids (Bowell et. al., 1992) has located Palomar Sky Survey photographic plates taken in 1949 observations of (4015) 1979 VA, not as an asteroid, but rather a small cometary image (IAU Circular Nos. 5585 and 5586, August 13, 1992). In 30 years, we have witnessed photographically, the physical transition of a comet to an asteroid.

(4015) 1979 VA was observed last year in order to see if any cometary activity was present during this approach to perihelion. No obvious activity was detected from ground based telescopes. As mentioned earlier, the observations from 1949 show the object as an asteroidal like image, but with a small tail. In 1979, when discovered as a bright asteroid, it showed no apparent coma or tail. Curiously, however, there were some unexplainable irregularities in the data. Review of this data leads to the theory that it may have been degassing intermittently (Harris, personal communication). Review of the large amount of data is now underway to better understand this tantalizing object.

As a consequence of identifying (4015) 1979 VA as a former comet, it has become a priority small body target for a Discovery Mission. The selection of (4015), a defunct comet, is an exciting target considering its recent evolution into an asteroid. NASA and ESA are both considering missions to (4015). This evidence of the generic relationship between comets and asteroids has been long-awaited.

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